



Climate Summary for Winter 2019/20 Outlook for Summer 2020

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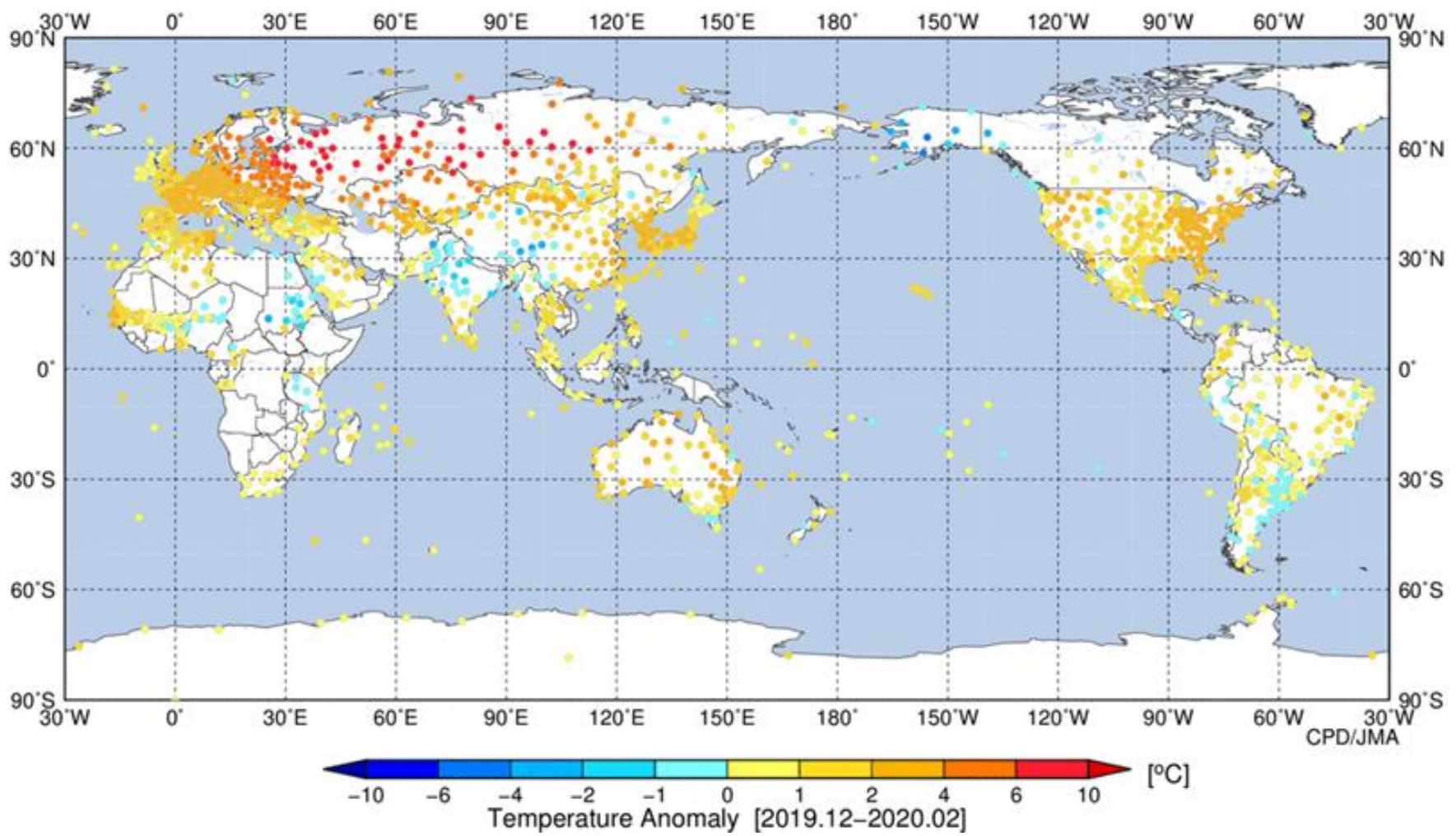
FOCRAII 2020

1. Climate Summary for Winter 2019/20



Seasonal mean temperature for Dec 2019 – Feb 2020

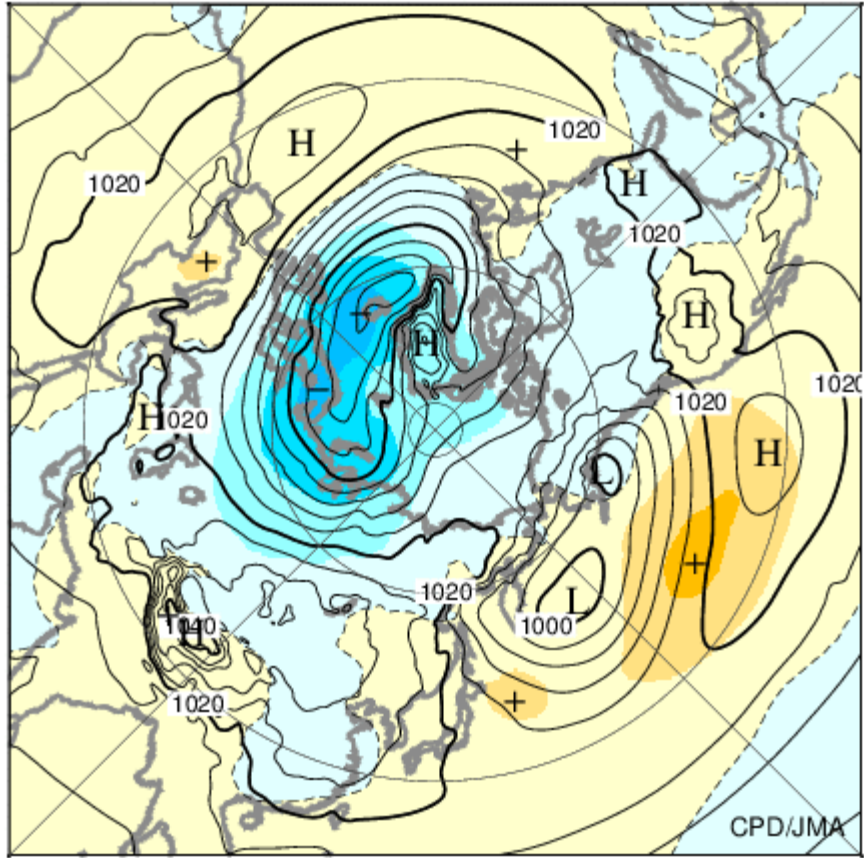
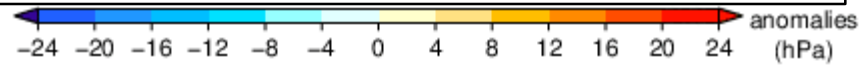
Temperature Anomaly (degC) [term : 201912–202002]





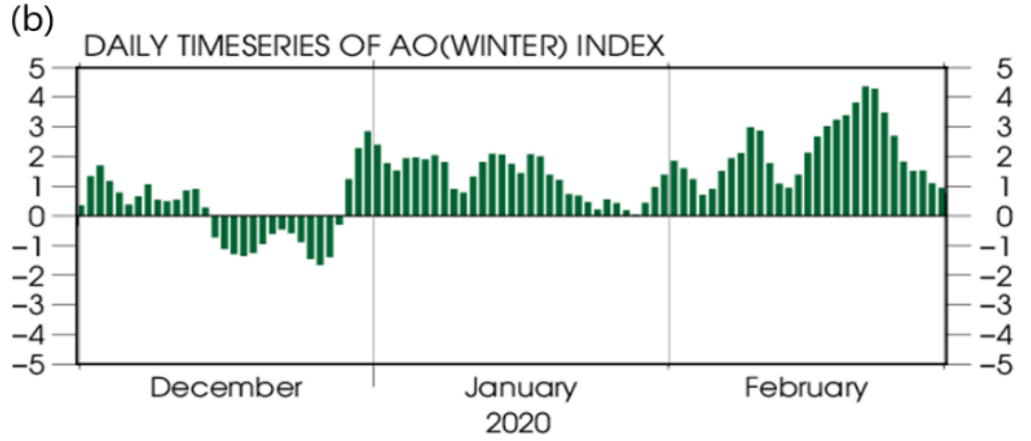
NH circulation for winter 2019/20

Northern Hemispheric SLP for Dec 2019 – Feb 2020



Three month mean sea level pressure and anomaly in the Northern Hemisphere (Dec.2019–Feb.2020)
The contours show sea level pressure at intervals of 4 hPa.
The shading indicates sea level pressure anomalies.
Anomalies are deviations from the 1981–2010 average.

AO index

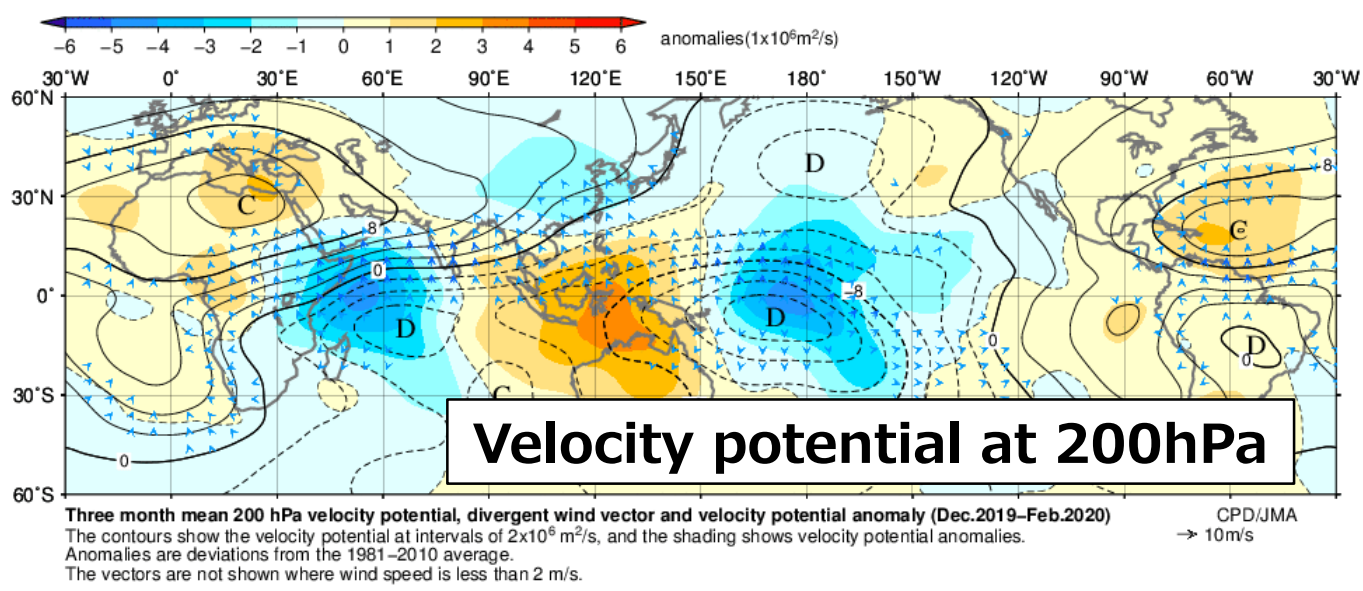
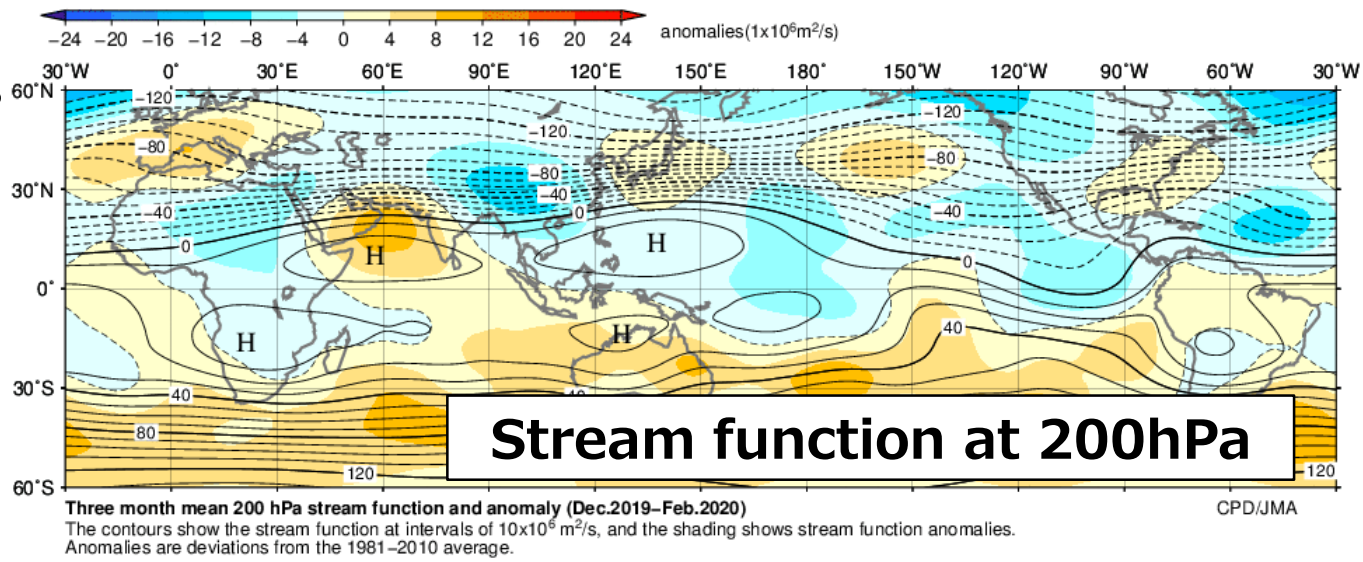


- The positive phase of the Arctic Oscillation (AO) pattern was dominant in the Northern Hemisphere
- The polar air mass was confined to within higher latitudes.



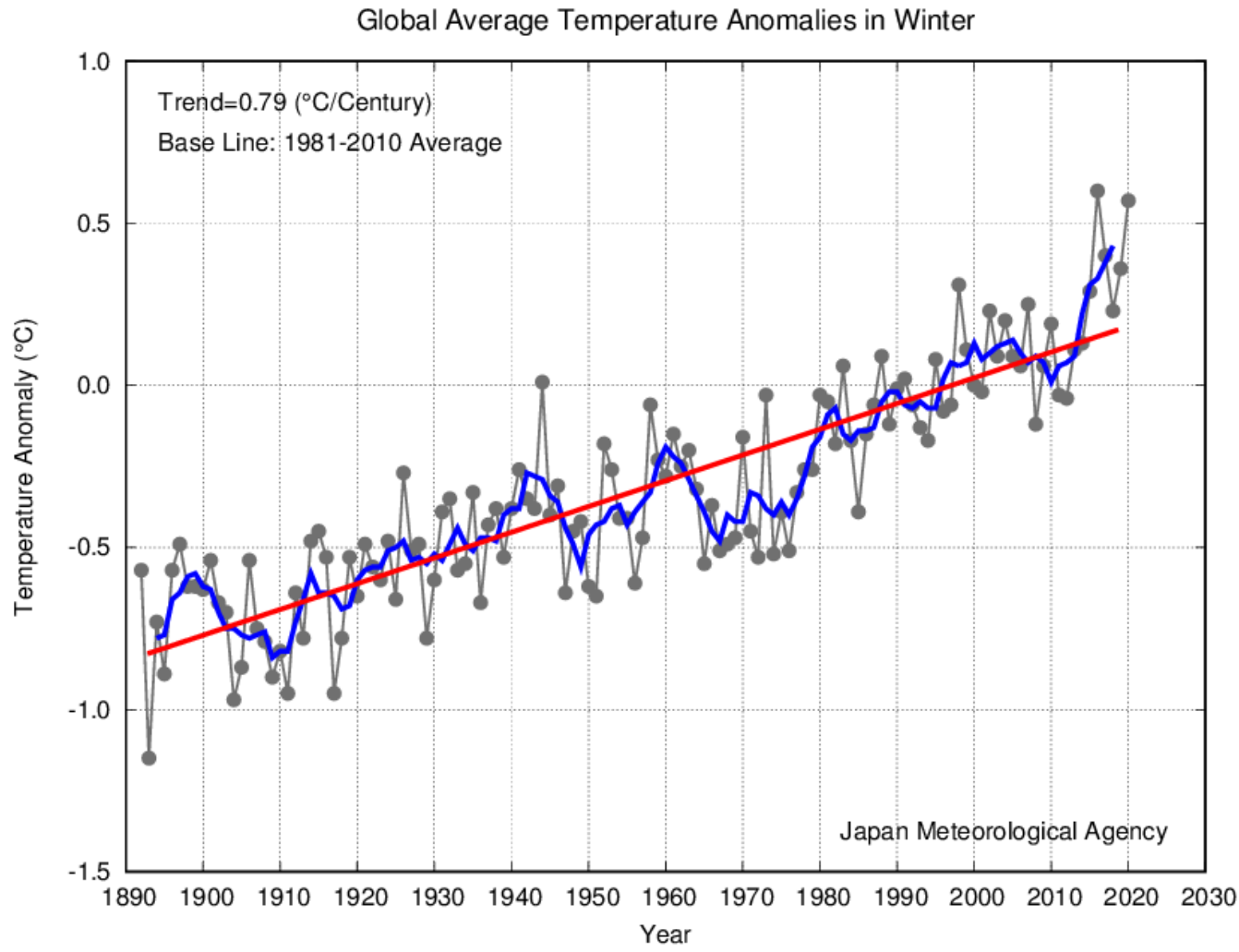
Circulation in tropics for winter 2019/20

- Convective activity was enhanced over the western Indian Ocean and suppressed over the Maritime Continent
- In response, a Rossby wave train was seen along the STJ from the Arabian Sea to Japan
- This partly contributed to the record warmest winter in Japan





Long-term warming trend



Anomalies are deviation from baseline (1981-2010 Average).
The black thin line indicates surface temperature anomaly of each year.
The blue line indicates their 5-year running mean.
The red line indicates the long-term linear trend.

2. Outlook for summer monsoon circulation 2020

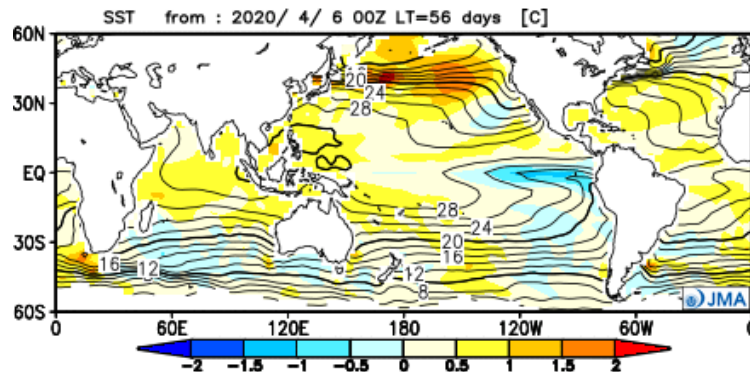
<JJA 2020> Sea Surface Temperature (SST)

- ENSO-neutral conditions are likely (60%) to continue until boreal summer.
- The NINO.WEST SST is likely to be near normal during boreal spring and near or above normal in boreal summer.
- The IOBW SST is likely to be above normal during boreal spring and above or near normal in boreal summer.

Three month mean Sea surface temperature (SST)

Contour: SST (°C); Shading: SST anomalies.

Ensemble forecast (3 months mean : JUN–AUG)

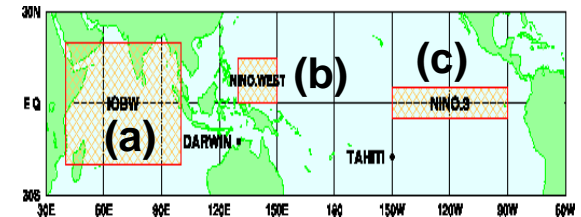
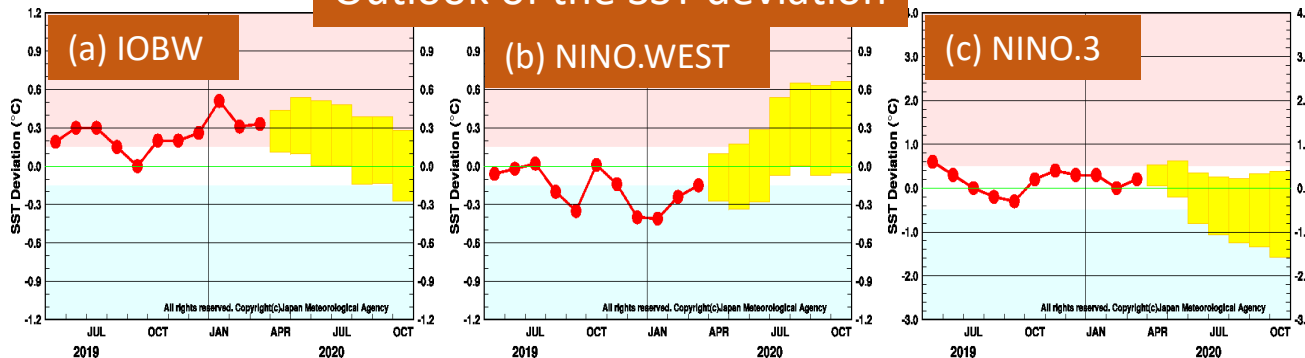


ENSO forecast probabilities

YEAR	MONTH	mean period	El Niño	ENSO neutral	La Niña
	FEB	DEC2019–APR2020	0	100	0
	MAR	JAN2020–MAY2020	0	100	0
	APR	FEB2020–JUN2020	10	90	0
2020	MAY	MAR2020–JUL2020	10	80	10
	JUN	APR2020–AUG2020	10	80	10
	JUL	MAY2020–SEP2020	10	70	20
	AUG	JUN2020–OCT2020	10	60	30

■ El Niño ■ ENSO neutral ■ La Niña

Outlook of the SST deviation



Verification based on hindcast

<https://ds.data.jma.go.jp/tcc/tcc/products/model/hindcast/CPS2/index.html>

<https://ds.data.jma.go.jp/tcc/tcc/products/model/hindcast/CPS2/shisu/shisu.html>

(See “Explanatory Notes (2)”
for the definition of the SST indices.)

<JJA 2020 > Global Circulation

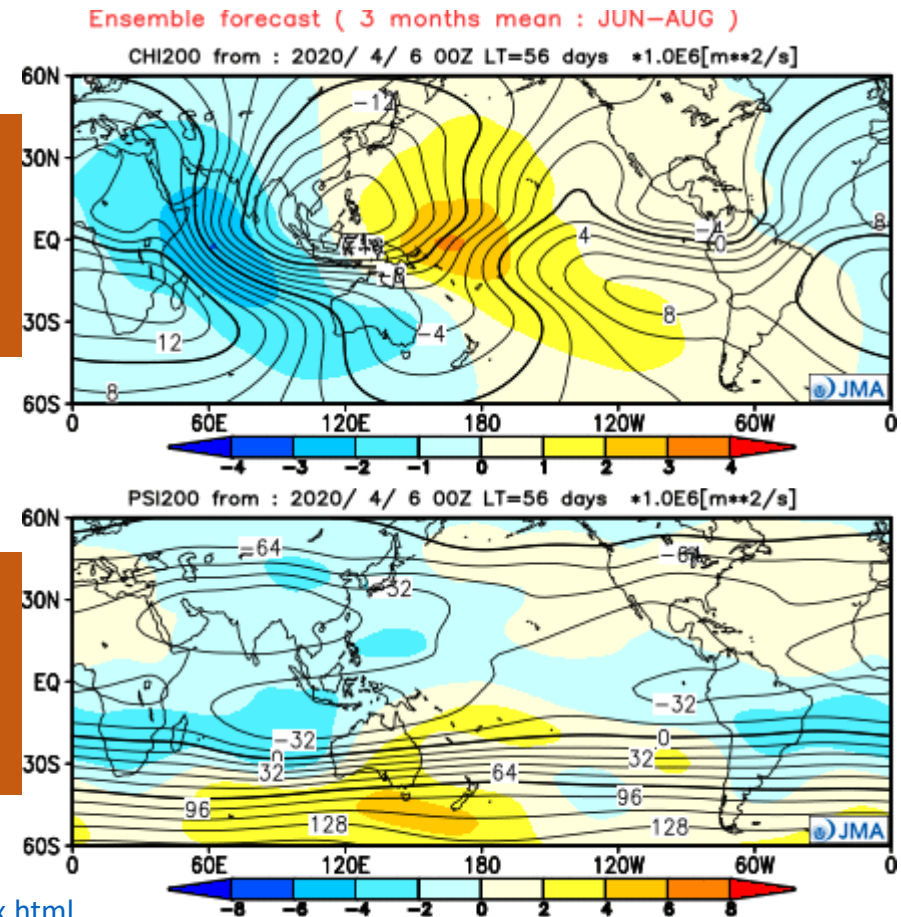
- In the 200-hPa velocity potential field, negative (large-scale divergence) anomalies are predicted over the western tropical Indian Ocean, and positive (large-scale convergence) anomalies are predicted over the western tropical Pacific.
- In the 200-hPa stream function field, cyclonic circulation anomalies are predicted over east of the Philippines.

Three month mean
200-hPa velocity potential

Contour: 200-hPa velocity potential ($10^6 \text{ m}^2/\text{s}$)
Shading: 200-hPa velocity potential anomalies ($10^6 \text{ m}^2/\text{s}$)

Three month mean
200-hPa stream function

Contour: 200-hPa stream function ($10^6 \text{ m}^2/\text{s}$)
Shading: 200-hPa stream function anomalies ($10^6 \text{ m}^2/\text{s}$)



Verification based on hindcast

<https://ds.data.jma.go.jp/tcc/tcc/products/model/hindcast/CPS2/index.html>

<JJA 2020> Asian Circulation

- In the 850-hPa stream function field, anti-cyclonic circulation anomalies are predicted over the northern part of the Philippine Sea.
- In the sea level pressure field, positive anomalies are predicted in and around the Philippine Sea, and negative anomalies are predicted over the western tropical Indian Ocean.
- Above-normal precipitation is predicted in and around the southern part of South Asia and the southern part of Southeast Asia.

Three month mean

(a) 850-hPa stream function anomalies and wind vector anomalies

Contour&Shading: 850-hPa stream function anomalies ($10^6 \text{ m}^2/\text{s}$)

Vector: wind vector anomalies (m/s)

(b) sea level pressure and its anomalies

Contour: sea level pressure (hPa)

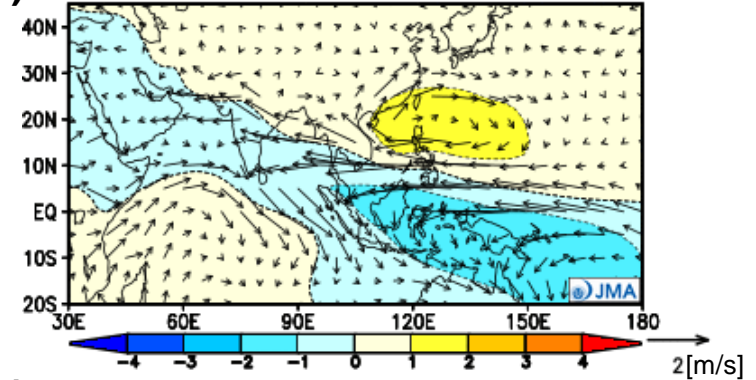
Shading: sea level pressure anomalies (hPa)

(c) precipitation and its anomalies

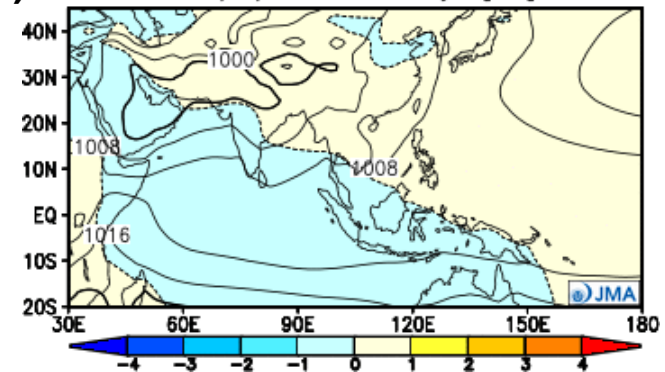
Contour: precipitation (mm/day)

Shading: precipitation anomalies (mm/day)

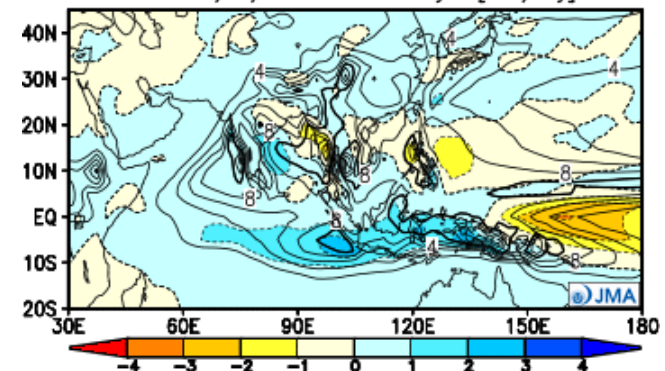
(a) PSI850 & wind850 from : 2020/ 4/ 6 00Z LT=56 days *1.0E6[m**2/s]



(b) PSEA from : 2020/ 4/ 6 00Z LT=56 days [hPa]



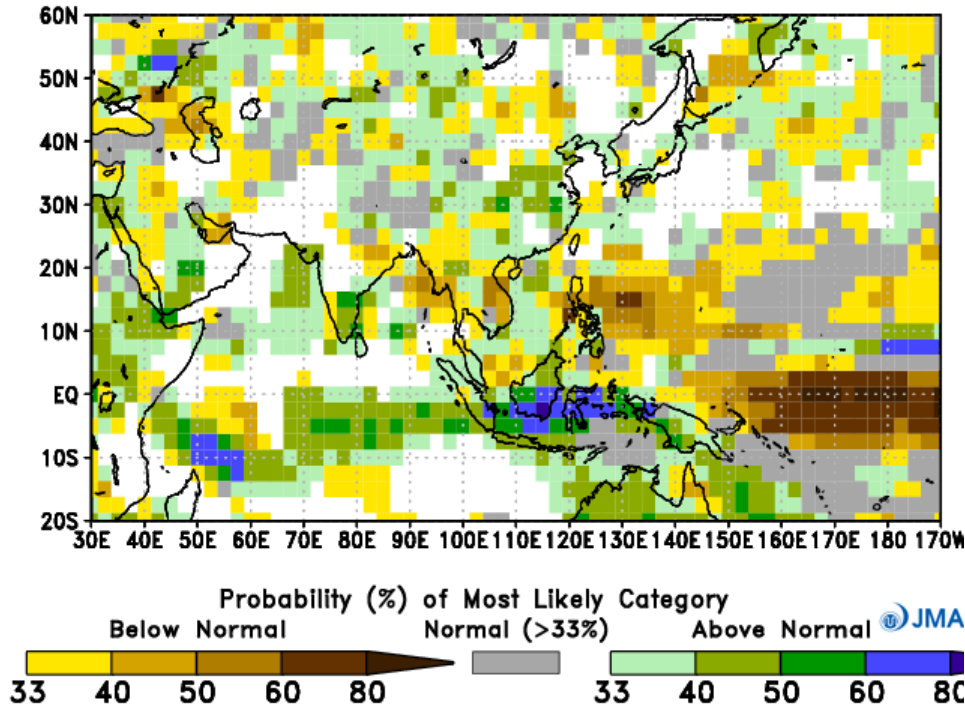
(c) RAIN from : 2020/ 4/ 6 00Z LT=56 days [mm/day]



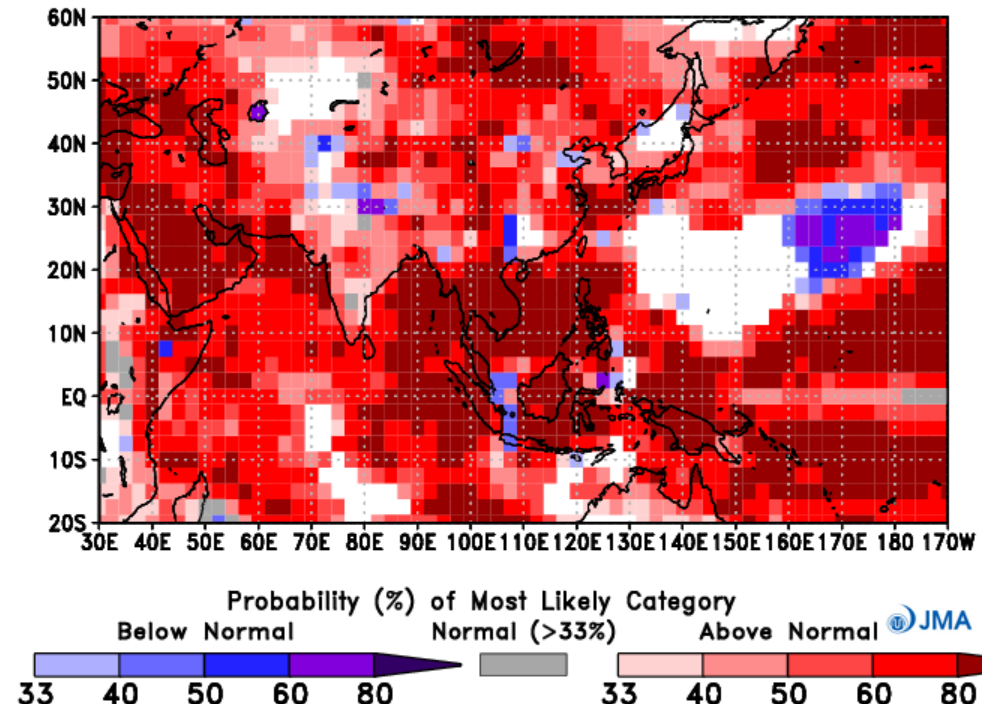
<JJA 2020> Probability Forecasts

- A high probability of above-normal precipitation is predicted over the southern part of Southeast Asia.
- A high probability of above-normal temperatures is predicted over the Middle East, Southeast Asia, and part of East Asia.

JMA Seasonal Forecast (Forecast initial month is 04 2020)
Most likely category of Precipitation for JJA 2020



JMA Seasonal Forecast (Forecast initial month is 04 2020)
Most likely category of Surface Temperature for JJA 2020



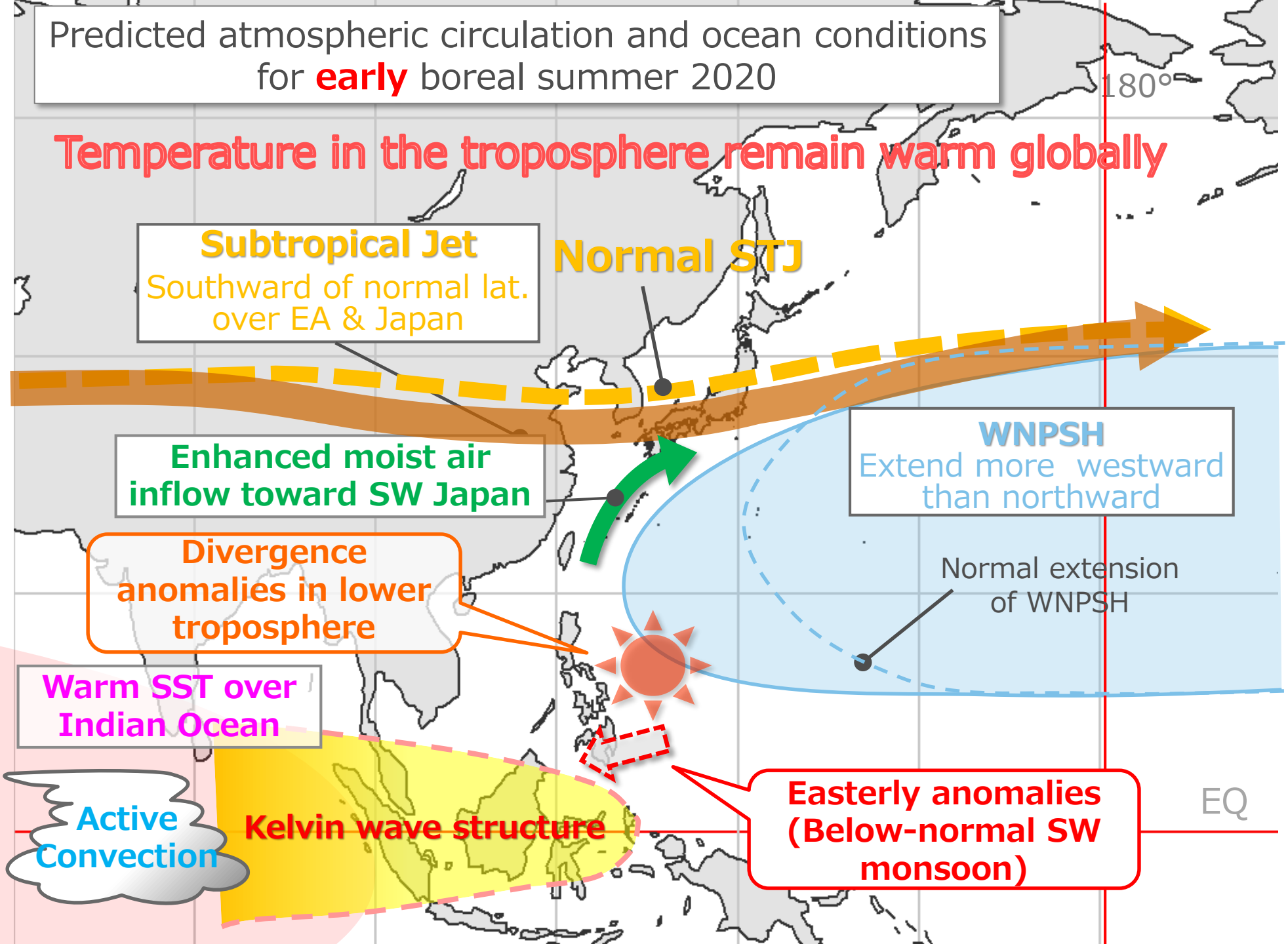
Verification based on hindcast

https://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/warm_cold_season/hind/html/skill_reg_warm_cold_season.html

https://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/warm_cold_season/hind/html/skill_2d_warm_cold_season.html

Predicted atmospheric circulation and ocean conditions for **early** boreal summer 2020

Temperature in the troposphere remain warm globally



Subtropical Jet

Southward of normal lat. over EA & Japan

Normal STJ

Enhanced moist air inflow toward SW Japan

Divergence anomalies in lower troposphere

Warm SST over Indian Ocean

Active Convection

Kelvin wave structure

Easterly anomalies (Below-normal SW monsoon)

WNP SH
Extend more westward than northward

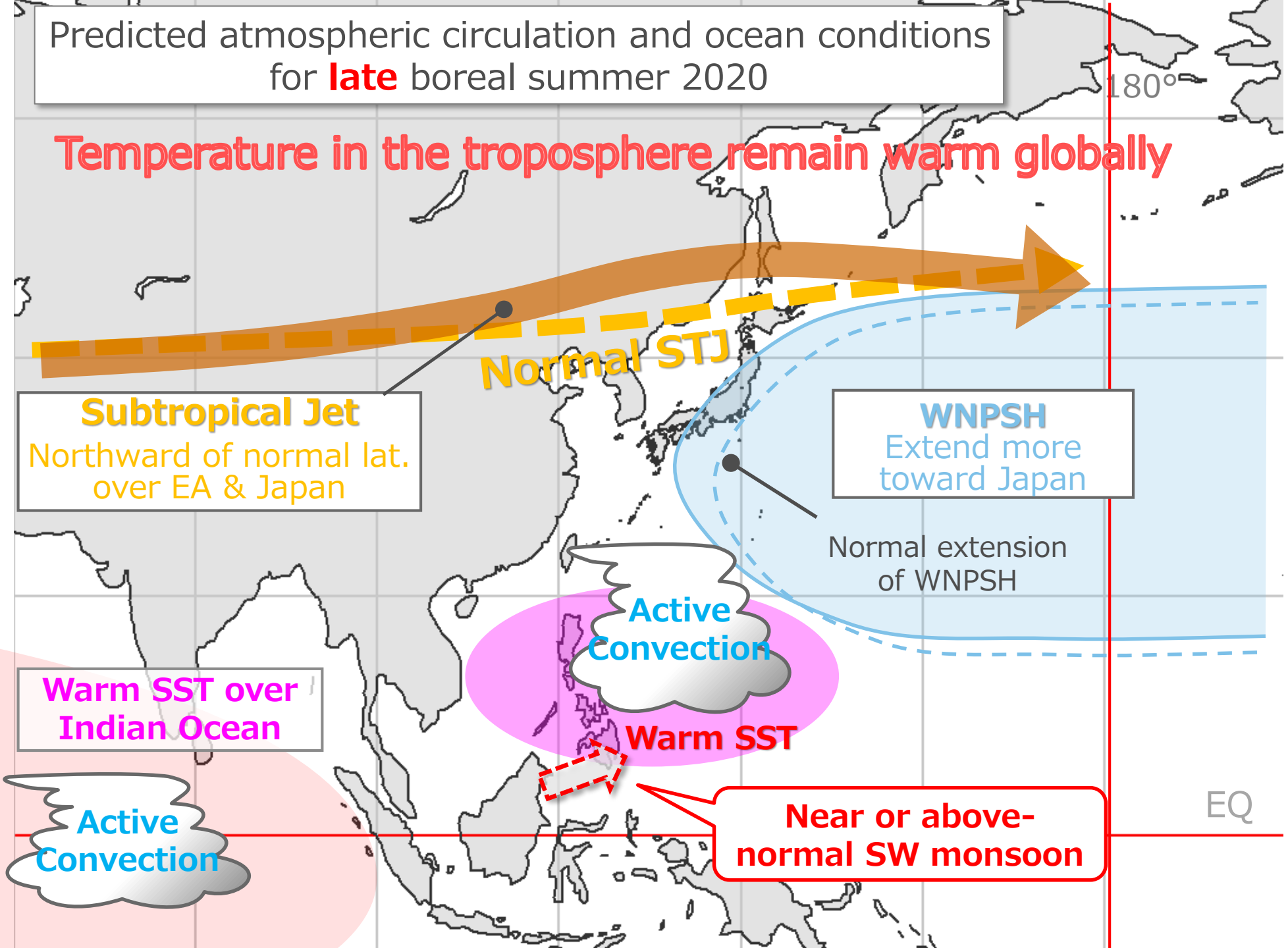
Normal extension of WNP SH

EQ

180°

Predicted atmospheric circulation and ocean conditions
for **late** boreal summer 2020

Temperature in the troposphere remain warm globally



Subtropical Jet
Northward of normal lat.
over EA & Japan

Normal STJ

WNPSH
Extend more
toward Japan

Normal extension
of WNPSH

**Warm SST over
Indian Ocean**

**Active
Convection**

Warm SST

**Active
Convection**

**Near or above-
normal SW monsoon**

EQ

180°

3. Forecast for Japan

110°

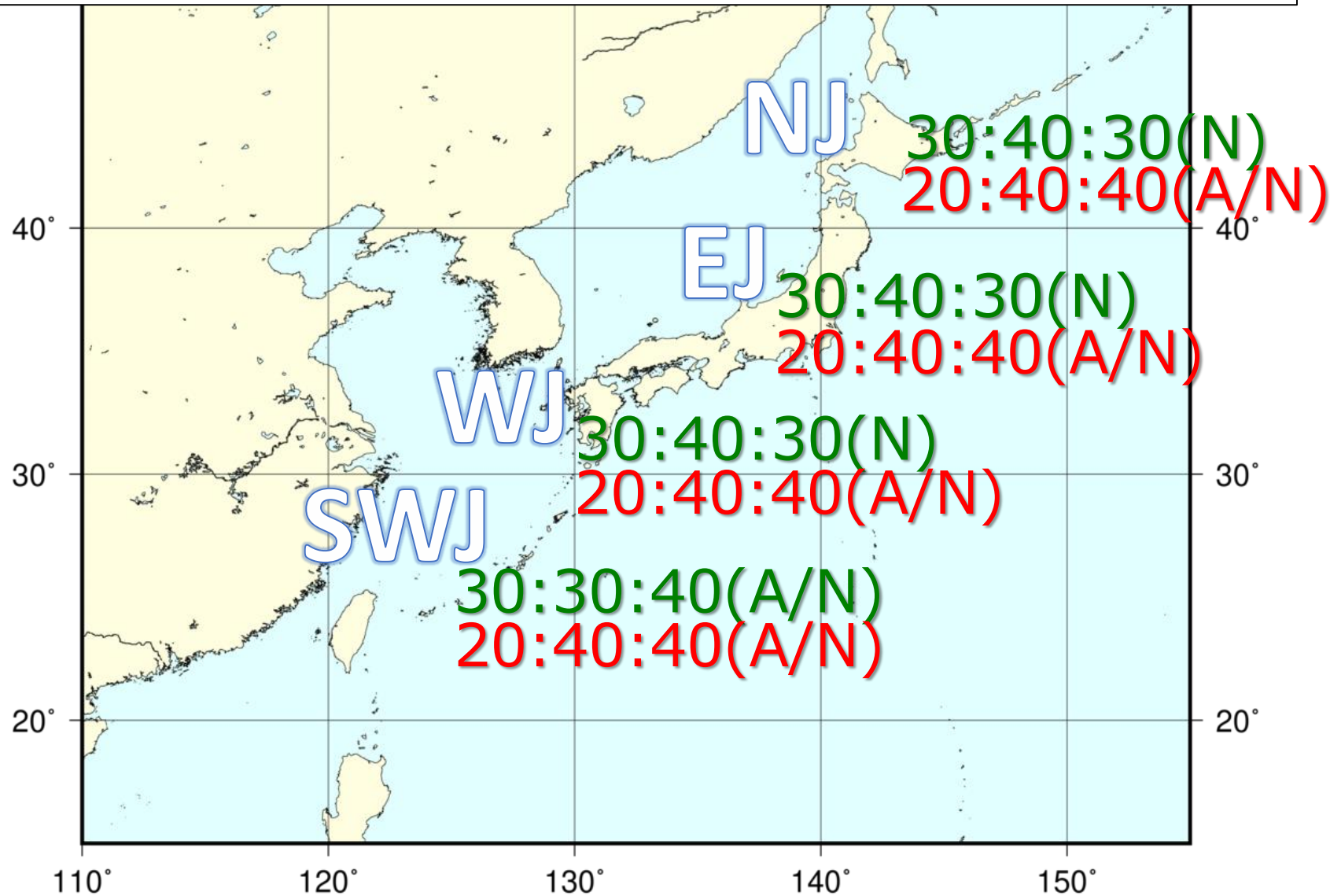
120°

130°

140°

150°

Probabilistic **temperature** & **precipitation** forecast for JJA



Thank you

